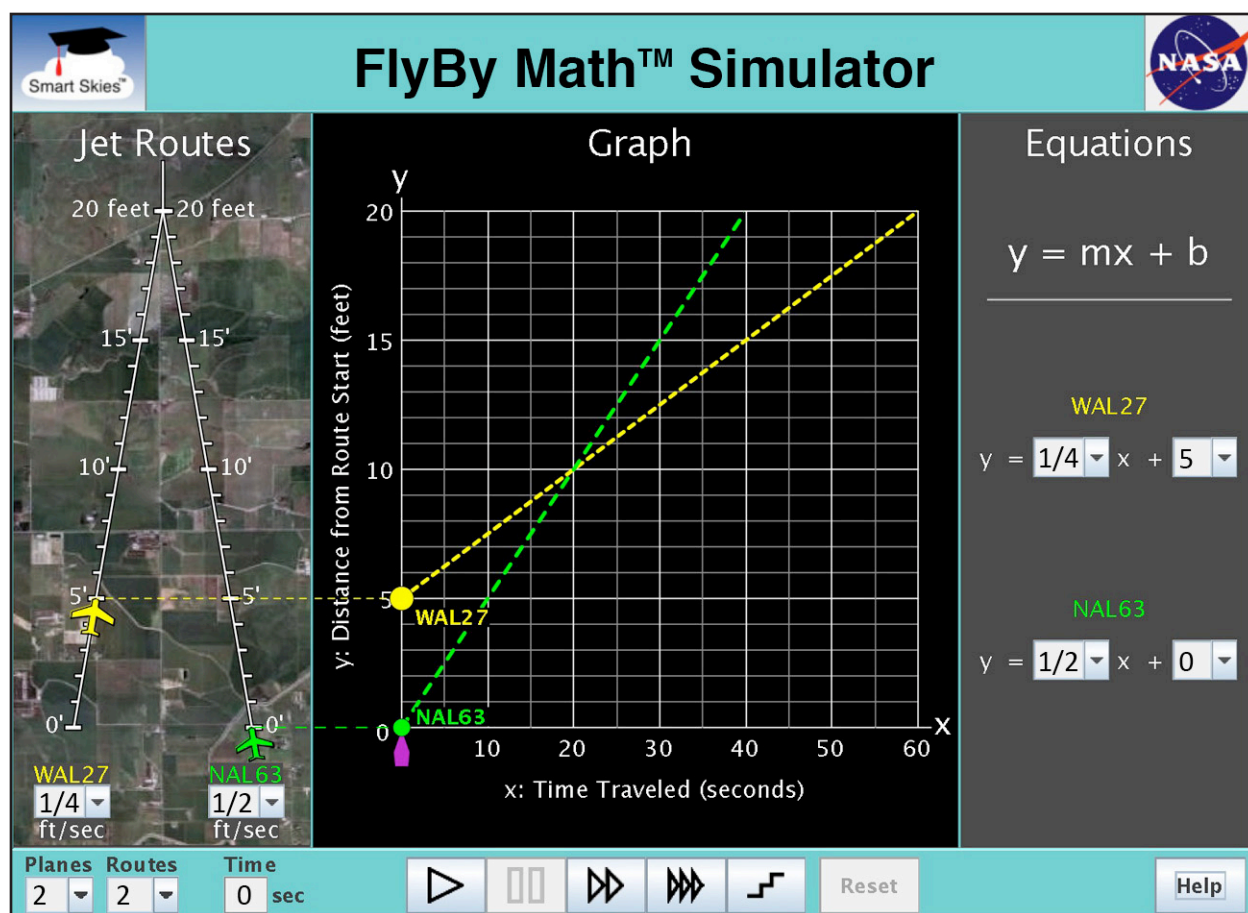


Student Worksheet E**Analyzing a Distance vs. Time Graph for Two Planes**

In this worksheet, you will work with **2 planes**. Sometimes you will work with **1 jet route**; other times you will work with **2 jet routes**.

- Each jet route is 20 feet long.
- The jet routes meet at the 20-foot mark.
- The planes are flying at the same altitude.
- The planes are flying at different speeds.
- The planes have different starting positions.

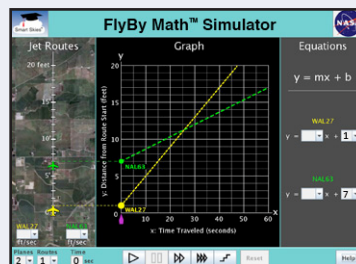


You will use the simulator to learn:

- What happens in the **Jet Route Panel** when two lines cross in the **Graph Panel**.
(Do the two planes collide or not?)

Problem 1: Set up the simulator

- Time slider: 0 seconds
- 2 planes, **1 route**
- WAL27 starting position: 1 ft
- NAL63 starting position: 7 ft
- Make sure the NAL63 line crosses the WAL27 line somewhere near the center of the Graph Panel. (You may need to grab and rotate one or both lines.)



In the **Graph Panel**, drag the time slider (▲) until the NAL63 dot is on top of the WAL27 dot where the lines cross. Then answer these questions.



(a) In the **Jet Route Panel**, do the planes collide? Yes No

(b) DO NOT RESET the problem. In the **Jet Route Panel**, choose TWO (2) jet routes.



In the **Jet Route Panel**, do the planes collide? Yes No

(c) Fill in the blank to complete each sentence.



With **one** jet route, the lines crossed on the graph and the planes _____ collide.
(did / did not)



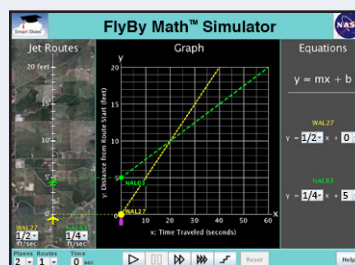
With **two** jet routes, the lines crossed on the graph and the planes _____ collide.
(did / did not)



Analyzing What Happens on the Jet Route(s) When Two Lines Cross on the Graph

Problem 2: Set up the simulator

- Time slider: 0 seconds
- 2 planes, **1 route**
- WAL27 start: 0 ft, $\frac{1}{2}$ ft/sec
- NAL63 start: 5 ft, $\frac{1}{4}$ ft/sec



In the **Graph Panel**, drag the time slider to 20 seconds so the WAL27 dot and the NAL63 dot are at the point where the lines cross. Then answer these questions.

(a) In the **Graph Panel**, the lines cross when time $x = 20$ seconds.



In the **Jet Route Panel**:

- Do the planes collide? Yes No
- How far is WAL27 from the start of the jet route? _____ ft
- How far is NAL63 from the start of the jet route? _____ ft
- Are these distances the same? Yes No



(b) In the **Graph Panel**, at the point where the lines cross, what is the **y-coordinate** for each plane?

WAL27: $(x, y) = (20 \text{ seconds}, \text{_____ ft})$

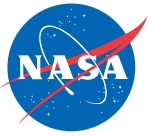
NAL63: $(x, y) = (20 \text{ seconds}, \text{_____ ft})$

(c) DO NOT RESET the problem. In the **Jet Route Panel**, choose TWO (2) jet routes. In the **Graph Panel**, the lines cross when time $x = 20$ seconds.



In the **Jet Route Panel**:

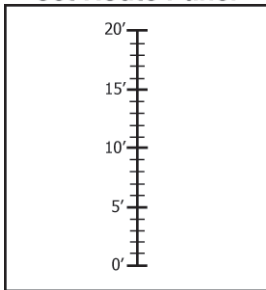
- Do the planes collide? Yes No
- How far is WAL27 from the start of its jet route? _____ ft
- How far is NAL63 from the start of its jet route? _____ ft
- Are the distances the same? Yes No



Problem 3:

Two Jet Route Panels are shown.

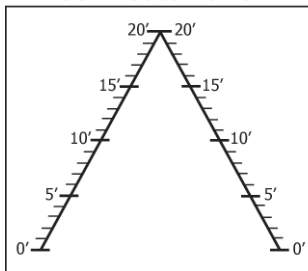
Jet Route Panel



(a) Check **all** the places where two planes could collide on **one** jet route.

- ☐ At 0 feet, where the route begins.
- ☐ At 20 feet, where the route ends.
- ☐ Anywhere else along the route.

Jet Route Panel



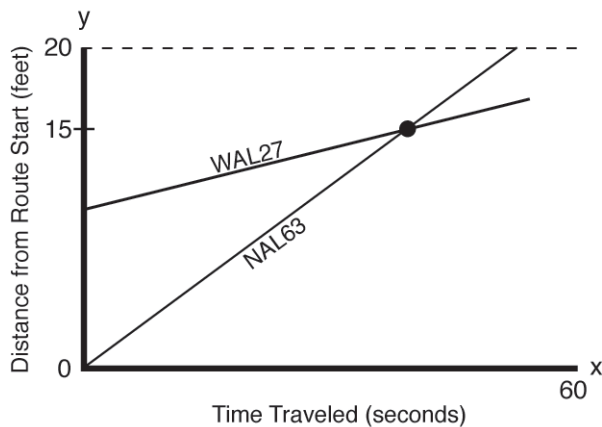
(b) Check **all** the places where two planes could collide on these **two** jet routes.

- ☐ At 0 feet, where each route begins.
- ☐ At 20 feet, where the routes meet.
- ☐ Anywhere else along the routes.

Summarizing What Happens on the Jet Route(s) When Two Lines Cross on the Graph

Problem 4:

A graph for two planes is shown.



(a) WAL27 and NAL63 are flying on the **same** 20-foot jet route.

The lines cross on the graph at $y = 15$ feet.

Do the planes collide on the jet route?

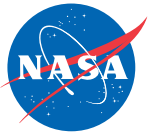
Yes No

(b) WAL27 and NAL63 are flying on **different** jet routes that meet at 20 feet.

The lines cross on the graph at $y = 15$ feet.

Do the planes collide on the jet routes?

Yes No



Problem 5:

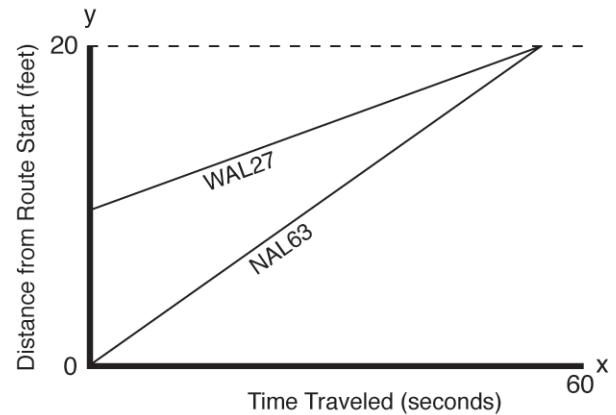
A graph for two planes is shown.

- (a) WAL27 and NAL63 are flying on **different** jet routes that meet at 20 feet.

The lines meet on the graph at $y = 20$ feet.

Do the planes collide on the jet routes?

Yes No



How do you know? _____

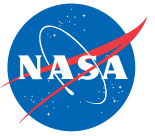
Problem 6: SUMMARIZE

- (a) Check the sentences for which you are **sure** that two planes **do collide**.

- ☐ In the Graph Panel, the two lines cross or meet.
- ☐ In the Graph Panel, the two lines are parallel. (The lines have the same slope.)
- ☐ In the Graph Panel, the two lines cross or meet; in the Jet Route Panel, the planes are on the *same* route.
- ☐ In the Graph Panel, the two lines cross or meet; in the Jet Route Panel, the planes are on *different* routes that meet at an intersection.

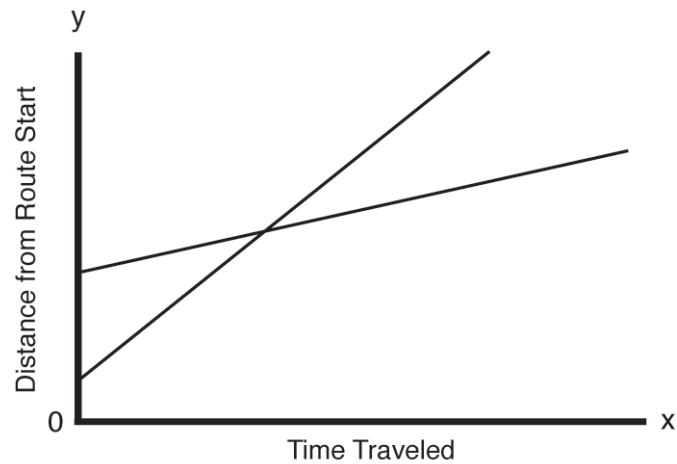
- (b) Check the sentences for which you are **sure** that two planes **do NOT collide**.

- ☐ In the Graph Panel, the two lines cross or meet.
- ☐ In the Graph Panel, the two lines are parallel. (The lines have the same slope.)
- ☐ In the Graph Panel, the two lines cross or meet; in the Jet Route Panel, the planes are on the *same* route.
- ☐ In the Graph Panel, the two lines cross or meet; in the Jet Route Panel, the planes are on *different* routes that meet at an intersection.



Problem 7:

GO BEYOND: Check **all** the different situations that **could** be represented by this graph.



- ☐ Two planes flying on the same jet route.
- ☐ Two planes flying on different jet routes that meet.
- ☐ Two planes flying on different jet routes that do not meet.
- ☐ Two cars driving on different roads.
- ☐ Two trains on the same track traveling toward each other.
- ☐ Two trains on different tracks traveling away from each other.